CHAPTER 5

ARITHMETIC PROGRESSIONS

REVISION OF KEY CONCEPTS AND FORMULAE

1. A sequence is an arrangement of numbers or objects in a definite order.
2. A sequence $a_1, a_2, a_3, \ldots, a_n, \ldots$ is called an arithmetic progression, if there exists a constant d such that $a_2 - a_1 = d, a_3 - a_2 = d, a_4 - a_3 = d, \ldots, a_{n+1} - a_n = d$ and so on.
   The constant 'd' is called the common difference.
3. If 'a' is the first term and 'd' the common difference of an AP, then the A.P. is
   $$a, a+d, a+2d, a+3d, a+4d, \ldots$$
4. A sequence $a_1, a_2, a_3, \ldots, a_n, \ldots$ is an AP, if $a_{n+1} - a_n$ is independent of n.
5. A sequence $a_1, a_2, a_3, \ldots, a_n, \ldots$ is an AP, if and only if its n^{th} term a_n is a linear expression in n and in such a case the coefficient of n is the common difference.
   i.e. $a_1, a_2, a_3, \ldots, a_n, \ldots\ldots$ is an AP with common difference 'A' if and only if $a_n = An + B$.
6. The n^{th} term a_n of an A.P. with first term 'a' and common difference 'd' is given by
   $$a_n = a + (n-1)d.$$
7. Let there be an A.P. with first term 'a' and common difference d. If there are m terms in the AP, then
   n^{th} term from the end $= (m-n+1)^{\text{th}}$ term from the beginning $= a + (m-n)d$
   Also,
   n^{th} term from the end $=$ Last term $+ (n-1)(-d) = l - (n-1)d$, where l denotes the last term.
8. Various terms is an A.P. can be chosen in the following manner.

Number of terms	*Terms*	*Common difference*
3	$a-d, a, a+d$	d
4	$a-3d, a-d, a+d, a+3d$	$2d$
5	$a-2d, a-d, a, a+d, a+2d$	d
6	$a-5d, a-3d, a+d, a+3d, a+5d$	$2d$

9. The sum to n terms of an A.P. with first term 'a' and common difference 'd' is given by
   $$S_n = \frac{n}{2}\{2a + (n-1)d\}$$
   Also, $S_n = \frac{n}{2}\{a + l\}$, where l = last term $= a + (n-1)d$
10. If the ratio of the sums of n terms of two AP's is given, then to find the ratio of their n^{th} terms, we replace n by $(2n-1)$ in the ratio of the sums of n terms.
11. A sequence is an A.P. if and only if the sum of its n terms is of the form $An^2 + Bn$, where A, B are constants. In such a case the common difference is $2A$.
12. If $a_1, a_2, a_3, a_4, \ldots, a_n, \ldots$ is an AP with common difference 'd', then $a_p - a_q = (p-q)d$.

13. The sum of first n natural numbers is $\frac{n(n+1)}{2}$ i.e. $1+2+3+\ldots+n=\frac{n(n+1)}{2}$

14. The sum of first n odd natural numbers is n^2 i.e. $1+3+5+\ldots+(2n-1)=n^2$

15. The sum of first n even natural number is $n(n+1)$

i.e. $2+4+6+\ldots+2n=2(1+2+3+\ldots+n)=2n\frac{(n+1)}{2}=n(n+1)$.

16. In a finite AP the sum of the terms equidistant from the beginning and the end is always same and is equal to the sum of its first and the last term.

17. If S_n denotes the sum of n terms of an AP with common difference d, then

$$a_n=S_n-S_{n-1} \text{ and } d=S_n-2S_{n-1}+S_{n-2}$$

SOLVED EXAMPLES

MULTIPLE CHOICE QUESTIONS (MCQs)

EXAMPLE 1 *The next term of the A.P.* $\sqrt{18}, \sqrt{50}, \sqrt{98}, \ldots$ *is*

(a) $\sqrt{146}$ (b) $\sqrt{128}$ (c) $\sqrt{162}$ (d) $\sqrt{200}$

Ans. (c) [CBSE 2012]

SOLUTION Given A.P. is $3\sqrt{2}, 5\sqrt{2}, 7\sqrt{2}, \ldots$ Clearly, first term $a=3\sqrt{2}$ and common difference $d=2\sqrt{2}$. So, the next term is $2\sqrt{2}$ more than the preceding term $7\sqrt{2}$. Hence, it is $9\sqrt{2}=\sqrt{162}$.

EXAMPLE 2 *The* 12^{th} *term of an AP whose first two terms are* -3 *and* 4 *is*

(a) 67 (b) 74 (c) 60 (d) 81

Ans. (b)

SOLUTION Let a be the first term and d be the common difference of the given A.P. It is given that

$$a=-3 \text{ and } a+d=4 \Rightarrow a=-3 \text{ and } d=7$$

$\therefore$ 12^{th} term $=a+(12-1)d=a+11d=-3+11\times 7=74$

EXAMPLE 3 *The* 7^{th} *term from the end of the A.P. 7, 11, 15, ..., 107, is*

(a) 79 (b) 83 (c) 81 (d) 87

Ans. (b)

SOLUTION The common difference and the last term of the given A.P. are 7 and 107 respectively. If a_n is the last term of an AP with common difference 'd'. Then,

k^{th} term from the end $=a_n-(k-1)d$.

$\therefore$ 7^{th} term from the end $=107-(7-1)\times 4=107-24=83$

EXAMPLE 4 *If the common difference of an AP is 7, then* $a_{25}-a_{21}$ *is equal to*

(a) 14 (b) 20 (c) 28 (d) 35

Ans. (c)

SOLUTION If a_m and a_n are m^{th} and n^{th} terms of an AP with common difference 'd', then

$$a_m-a_n=\{a+(m-1)d\}-\{a+(n-1)d\}=(m-n)d$$

Hence, for the given A.P., we obtain

$$a_{25}-a_{21}=(25-21)\times 7=28$$

ALITER $a_{25}-a_{21}=(25-21)d=4d=4\times 7=28$

EXAMPLE 5 *If* $p-1$, $p+1$ *and* $2p+3$ *are in A.P., then the value of* p *is*

(a) -2 (b) 4 (c) 0 (d) 2

Ans. (c) [CBSE 2023]

SOLUTION $p-1$, $p+1$ and $2p+3$ will be in A.P., iff

$$2(p+1) = p-1+2p+3 \Rightarrow 2p+2 = 3p+2 \Rightarrow p = 0$$

EXAMPLE 6 *If $a_1, a_2, a_3, \ldots, a_n, \ldots$ is an AP such that $a_{20} - a_{12} = -32$ then the common difference of the A.P. is*

(a) 4 (b) − 4 (c) − 3 (d) 3

Ans. (b)

SOLUTION $a_m - a_n = (m-n)d$ [See S.No. 12 on page 5.1]

$\Rightarrow$ $a_{20} - a_{12} = (20-12)d \Rightarrow -32 = 8d \Rightarrow d = -4$

EXAMPLE 7 *If the n^{th} term of an AP is $3n+7$, then its common difference is*

(a) 7 (b) 3 (c) $3n$ (d) 1

Ans. (b) [CBSE 2023]

SOLUTION A sequence is an AP with common difference '*A*' if and only if its n^{th} term is of the form $An + B$. Here, $a_n = 3n+7$. So, it is *n*th term of an A.P. with common difference 3.

ALITER $d = a_n - a_{n-1} = (3n+7) - (3(n-1)+7) = 3.$

EXAMPLE 8 *If 11^{th} term from the end of the A.P.: 10, 7, 4, ..., − 62 is*

(a) 15 (b) 16 (c) − 32 (d) 0

Ans. (c) [CBSE 2023]

SOLUTION We find that 10, 7, 4, ..., − 62 is an A.P. with common difference $d = -3$.

$\therefore$ 11^{th} term from the end $= a_n + (11-1) \times -d = a_n - 10d = -62 - 10 \times -3 = -32$

EXAMPLE 9 *If the sum of n terms of an A.P. is $S_n = 3n^2 + 4n$, then common difference of the A.P. is*

(a) 7 (b) 5 (c) 8 (d) 6

Ans. (d)

SOLUTION We know that a sequence is an A.P. with common difference $2A$ iff the sum S_n of its n terms is $S_n = An^2 + Bn$. Hence, $S_n = 3n^2 + 4n$. So the common difference of the A.P. is $2 \times 3 = 6$.

EXAMPLE 10 *If a_p be the pth term of A.P. 3, 15, 27, ..., such that $a_p - a_{50} = 180$, then $p =$*

(a) 68 (b) 65 (c) 66 (d) 67

Ans. (b)

SOLUTION The common difference of the given A.P. is 12.

Now, $a_p - a_{50} = 180$

$\Rightarrow$ $(p-50)d = 180$ $[\because a_m - a_n = (m-n)d]$

$\Rightarrow$ $12(p-50) = 180 \Rightarrow p - 50 = 15 \Rightarrow p = 65$

EXAMPLE 11 *The sum of the first n odd natural numbers is*

(a) $2n$ (b) $2n+1$ (c) n^2 (d) $n^2 - 1$

Ans. (c)

SOLUTION First n odd natural numbers are 1, 3, 5, 7, ..., $(2n-1)$. Clearly, these numbers form an A.P. with first term 1, last term $= 2n-1$ and common difference = 2. Let S_n denote the sum. Then,

$$S_n = \frac{n}{2}(1 + 2n - 1) = n^2$$

EXAMPLE 12 *The sum of first n even natural numbers is*

(a) $2n$ (b) n^2 (c) $n^2 + n$ (d) $n^2 - 1$

Ans. (c)

SOLUTION Let S_n be the sum of first n even natural numbers. Then,

$$S_n = 2 + 4 + 6 + 8 + \ldots + 2n \Rightarrow S_n = 2\{1 + 2 + 3 + 4 + \ldots n\} = 2 \times \frac{n(n+1)}{2} = n^2 + n$$

EXAMPLE 13 *If the sum of first n odd natural numbers is 225, then the value of n is*

(a) 15 (b) 25 (c) 35 (d) 45

Ans.(a)

SOLUTION We have, $n^2 = 225 \Rightarrow n = 15$

EXAMPLE 14 *The sum of n terms of the series* $\sqrt{3} + \sqrt{12} + \sqrt{27} + \sqrt{48} + \ldots\ldots$, *is*

(a) $\frac{2n(n+1)}{\sqrt{3}}$ (b) $\frac{\sqrt{3}\,n(n-1)}{2}$ (c) $\frac{\sqrt{3}\,n(n+1)}{2}$ (d) $\frac{2n(n-1)}{\sqrt{3}}$

Ans.(c)

SOLUTION Let $S_n = \sqrt{3} + \sqrt{12} + \sqrt{27} + \sqrt{48} + \ldots$ to n terms. Then

$$S_n = \sqrt{3} + 2\sqrt{3} + 3\sqrt{3} + 4\sqrt{3} + \ldots \text{ to } n \text{ terms}$$

$$\Rightarrow \quad S_n = \sqrt{3}\,(1+2+3+4+\ldots \text{to } n \text{ terms}) = \frac{\sqrt{3}\,n(n+1)}{2} \qquad \left[\because 1+2+3+\ldots+n = \frac{n(n+1)}{2}\right]$$

EXAMPLE 15 *If nth term of an A.P. is* $(2n+1)$, *then the sum of first n terms of the A.P. is*

(a) $n(n-2)$ (b) $n(n+2)$ (c) $n(n+1)$ (d) $n(n-1)$

Ans.(b)

SOLUTION We have, $a_n = 2n+1$. Therefore, $a_1 = 2\times 1 + 1 = 3$

Hence, $S_n = \frac{n}{2}(a_1 + a_n) = \frac{n}{2}(3 + 2n + 1) = n(n+2)$

EXAMPLE 16 *If the ratio of* 18^{th} *term to* 11^{th} *term of an A.P. is 3 : 2, then the ratio of the* 21^{st} *term to* 5^{th} *term is*

(a) 3 : 2 (b) 3 : 1 (c) 1 : 3 (d) 2 : 3

Ans.(b)

SOLUTION Let a be the first term and d be the common difference of the given A.P. It is given that

$$\frac{a_{18}}{a_{11}} = \frac{3}{2} \Rightarrow \frac{a+17d}{a+10d} = \frac{3}{2} \Rightarrow a = 4d \;\therefore\; \frac{a_{21}}{a_5} = \frac{a+20d}{a+4d} = \frac{4d+20d}{4d+4d} = \frac{3}{1}$$

EXAMPLE 17 *If the sum of n terms of two A.P.'s are in the ratio* $(2n+3):(3n+2)$, *then the ratio of their* m^{th} *terms is*

(a) $(4m-1):(6m+1)$ (b) $(6m+1):(4m+1)$ (c) $(4m+1):(6m-1)$ (d) $(4m+1):(m+6)$

Ans.(c)

SOLUTION Let a_1, a_2 be the first terms and d_1, d_2 be the common differences of two A.P.'s. It is given that

$$\frac{\frac{n}{2}\{2a_1 + (n-1)d_1\}}{\frac{n}{2}\{2a_2 + (n-1)d_2\}} = \frac{2n+3}{3n+2} \Rightarrow \frac{2a_1 + (n-1)d_1}{2a_2 + (n-1)d_2} = \frac{2n+3}{3n+2} \Rightarrow \frac{a_1 + \left(\frac{n-1}{2}\right)d_1}{a_2 + \left(\frac{n-1}{2}\right)d_2} = \frac{2n+3}{3n+2}$$

Replacing $\frac{n-1}{2}$ by $m-1$ i.e. n by $(2m-1)$, we obtain

$$\frac{a_1 + (m-1)d_1}{a_2 + (m-1)d_2} = \frac{2(2m-1)+3}{3(2m-1)+2} \Rightarrow \frac{a_1 + (m-1)d_1}{a_2 + (m-1)d_2} = \frac{4m+1}{6m-1}$$

Hence, m^{th} terms of two A.P.'s are in the ratio $(4m+1):(6m-1)$.

CASE STUDY BASED EXAMPLES

EXAMPLE 18 *India is competitive manufacturing location due to the low cost manpower and strong technical and engineering capabilities contributing to higher quality production runs. The production of TV sets in a factory increases uniformly by a fixed number every year. It produced 16,000 sets in 6^{th} year and 22,600 in 9^{th} year. Based on the above information, answer the following:*

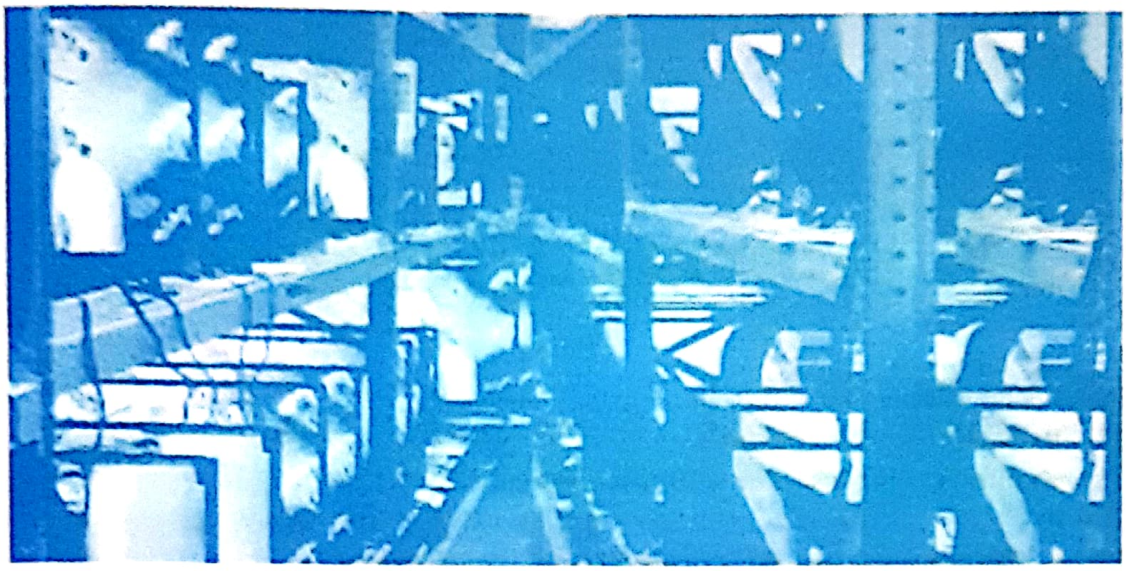


Fig. 5.1

(i) *The production of TV sets during the first year was*

(a) 2200 sets (b) 5650 sets (c) 5000 sets (d) 5750 sets

(ii) *The number of TV sets produced during the 8^{th} year was*

(a) 20,600 (b) 20,000 (c) 20,400 (d) 20,200

(iii) *Total number of TV sets produced in first five years was*

(a) 47,000 (b) 45,000 (c) 48,000 (d) 50,000

(iv) *In which year the production was 29,200. TV sets*

(a) 10 (b) 12 (c) 14 (d) 8

(v) *The difference of the production during 7^{th} year and 4^{th} year is*

(a) 6600 (b) 6000 (c) 5600 (d) 7600

SOLUTION (i) Ans. (c): As the production increases uniformly so the number of TV sets produced form an A.P. with first term 'a' (say) and common difference 'd' (say). It is given that

$$a_6 = 16000 \text{ and } a_9 = 22,600 \Rightarrow a + 5d = 16,000 \text{ and } a + 8d = 22,600 \Rightarrow a = 5000,\ d = 2200$$

(ii) Ans.(c): $a_8 = a + 7d = 5000 + 7 \times 2200 = 20400$

(iii) Ans.(a): $S_5 = \frac{5}{2}(2a + 4d) = 5(a + 2d) = 5(5000 + 4400) = 47,000$

(iv) Ans. (b): Let the production be 29,200 in n^{th} year. Then,

$\therefore \quad a_n = 29,200$

$\Rightarrow \quad a + (n-1)d = 29,200$

$\Rightarrow \quad 5000 + (n-1) \times 2200 = 29200 \Rightarrow 50 + 22n - 22 = 292 \Rightarrow 22n = 264 \Rightarrow n = 12$

(v) Ans. (a): Required difference $= a_7 - a_4 = (a + 6d) - (a + 3d) = 3d = 3 \times 2200 = 6600$

EXAMPLE 19 *John wants to participate in a 200 m race. He can currently run that distance in 51 seconds and with each day of practice it takes him 2 seconds less. He wants to do it in 31 seconds.*

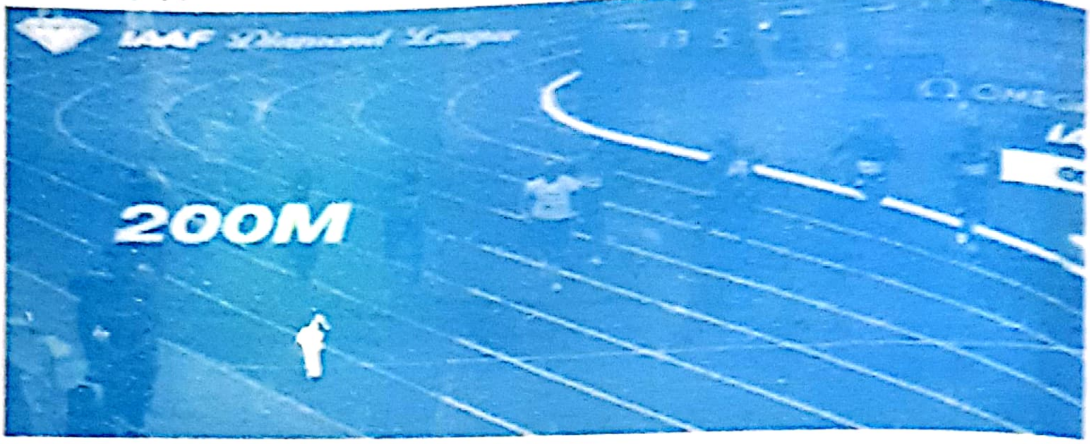


Fig. 5.2

(i) *Which of the following are in A.P. for the given situation?*
(a) 51, 53, 55, ... (b) 51, 49, 47, ... (c) −51, −53, −55, ... (d) 51, 55, 59, ...

(ii) *The minimum number of days he needs to practice to achieve the goal is*
(a) 10 (b) 12 (c) 11 (d) 9

(iii) *Which of the following terms is not in the A.P. of the given situation?*
(a) 41 (b) 30 (c) 37 (d) 39

(iv) *The common difference of the A.P. having* $a_n = 2n+3$ *as* n^{th} *term, is*
(a) 2 (b) 3 (c) 5 (d) 1

(v) *The value of x, for which 2x, x + 10, 3x + 2 are three consecutive terms of an A.P., is*
(a) 6 (b) −6 (c) 18 (d) −18

SOLUTION (i) Ans. (b): John takes 51 seconds to cover the distance in first run and takes 2 seconds less in each subsequent runs. So, time taken in first, second, third ... days are 51, 49, 47, 45, ...

(ii) Ans. (c): Suppose he practices for n days to achieve the goal. Then, n^{th} term of the A.P. 51, 49, 47, 45, ... is 31.

$\therefore$ $$31 = 51 + (n-1)\times(-2) \Rightarrow 31 = 51 - 2n + 2 \Rightarrow 2n = 22 \Rightarrow n = 11$$

(iii) Ans. (b): Terms of the given A.P. are odd numbers. Therefore, 30 being an even number cannot be a term of the given A.P.

(iv) Ans. (a): Common difference $= a_n - a_{n-1} = (2n+3) - (2n+1) = 2$

(v) Ans. (a): If $2x, x+10, 3x+2$ are in A.P., then

$$2(x+10) = 2x + (3x+2) \Rightarrow 2x + 20 = 5x + 2 \Rightarrow 3x = 18 \Rightarrow x = 6.$$

EXAMPLE 20 *Rishi wants to buy a car and plans to take loan from a bank to buy the car. He pays his total loan of ₹1,180,000 by paying every month starting with the first instalment of ₹10,000. If he increases the instalment by ₹1000 every month answer the following:*

Fig. 5.3

(i) *The amount paid by Rishi in 30^{th} instalment, is*

(a) ₹ 39,000 (b) ₹ 35,000 (c) ₹ 37,000 (d) ₹ 36,000

(ii) *The amount paid by Rishi in 30 instalments, is*

(a) ₹ 370,000 (b) ₹ 735,000 (c) ₹ 753,000 (d) ₹ 750,000

(iii) *After paying 30^{th} instalment the amount still to be paid is*

(a) ₹ 455,000 (b) ₹ 490,000 (c) ₹ 445,000 (d) ₹ 540,000

(iv) *If the loan is to be repaid in 40 instalments, then amount paid in the last instalment is*

(a) ₹ 49,000 (b) ₹ 39,000 (c) ₹ 59,000 (d) ₹ 94,000

(v) *The ratio of the first instalment to the last instalment is*

(a) 1 : 49 (b) 10 : 49 (c) 10 : 39 (d) 39 : 10

SOLUTION (i) Ans. (a): Various instalments form an A.P. with first term $a = 10{,}000$ and common difference $d = 1{,}000$

$\therefore$ Amount paid in 30th instalment $= ₹\{a + (30-1)d\} = ₹(10{,}000 + 29 \times 1000) = ₹39{,}000$

(ii) Ans. (b): The amount paid by Rishi in 30 instalments is

$$₹\left[\frac{30}{2}\{2a + (30-1)d\}\right] = ₹\{15(2a + 29d)\} = ₹15(20{,}000 + 29{,}000) = ₹735{,}000$$

(iii) Ans. (c): Loan amount $= ₹1{,}180{,}000$, Amount paid in 30 instalments $= ₹735{,}000$

$\therefore$ Amount to be paid after paying 30 instalments $= ₹(1{,}180{,}000 - 735{,}000) = ₹445{,}000$

(iv) Ans. (a): Amount paid in first 39 instalments is

$$₹\left[\frac{39}{2}\{2a + (39-1)d\}\right] = ₹\{39(a + 19d)\} = ₹39(10{,}000 + 19{,}000) = ₹1{,}131{,}000$$

$\therefore$ Amount to be paid in 40th instalment $= ₹(1{,}180{,}000 - 1{,}131{,}000) = ₹49{,}000$

(v) Ans. (b): First instalment $= ₹10{,}000$, Last instalment $= ₹49{,}000$

$\therefore$ Required ratio = 10 : 49

EXAMPLE 21 *Manpreet Kaur is the national record holder for women in the shot-put discipline. Her throw of 18.86 m at the Asian Grand Prix in 2017 is the biggest distance for an Indian female athlete. Keeping her as a role model, Sanjitha is determined to earn gold in Olympics one day. Initially her throw reached 7.56 m only. Being an athlete in school, she regularly practiced both in the mornings and in the evenings and was able to improve the distance by 9 cm every week. During the special camp for 15 days, she started with 40 throws and every day kept increasing the number of throws by 12 to achieve this remarkable progress.*

Fig. 5.4

(i) *How many throws Sanjitha practiced on 11^th^ day of the camp?*

(ii) *What would be Sanjitha's throw distance at the end of 6 months?*

(iii) *When will she be able to achieve a throw of 11.16 m?*

(iv) *How many throws did she do during the entire camp of 15 days?*

[CBSE Sample Paper 20..]

SOLUTION (i) Number of throws form an A.P. with first term $a = 40$, and common difference $d = 12$.

$\therefore$ Number of throws Sanjitha practiced on 11^{th} day $= a + (11-1)d = 40 + 10 \times 12 = 160$

(ii) Sanjitha's throw distances form an A.P. with first term $a = 7.56$ m and common difference $d = 9$ cm $= 0.09$ m. We find that

6 months = 6 × 4 weeks = 24 weeks.

$\therefore$ Sanjitha's throw distance at the end of 6 months $= a + (24-1)d = (7.56 + 23 \times 0.09)\,\text{m} = 9.63\,\text{m}$

(iii) Suppose Sanjitha achieve throw of 11.16 m at the end of n^{th} weeks. Then,

$$11.16 = 7.56 + (n-1) \times 0.09$$

$$\Rightarrow \quad 11.16 - 7.56 = (n-1) \times 0.09 \Rightarrow 3.6 = (n-1) \times 0.09 \Rightarrow n - 1 = \frac{3.6}{0.09} \Rightarrow n - 1 = 40 \Rightarrow n = 41$$

Hence, Sanjitha achieved throw of 11.16 m in 41 weeks.

(iv) Number of throws per day, in the camp of 15 days, form an A.P. with first term $a = 40$ and d = common difference = 12.

$\therefore$ Total number of throws in the camp of 15 days $= \frac{15}{2}\left\{2 \times 40 + (15-1) \times 12\right\} = \frac{15}{2}(80 + 168) = 1860$

Hence, Sanjitha threw 1860 throws in the camp of 15 days.

ASSERTION-REASON BASED MCQs

Each of the following examples contains STATEMENT-1 (Assertion) and STATEMENT-2 (Reason) and has following four choices (a), (b), (c) and (d), only one of which is the correct answer. Mark the correct choice.

(a) Statement-1 and Statement-2 are True; Statement-2 is a correct explanation for Statement-1.

(b) Statement-1 and Statement-2 are True; Statement-2 is not a correct explanation for Statement-1.

(c) Statement-1 is True, Statement-2 is False.

(d) Statement-1 is False, Statement-2 is True.

EXAMPLE 22 *Statement-1 (A):* *The sequence whose n^{th} term is given by $a_n = 7n - 5$ is an A.P. with common difference 7.*

Statement-2 (R): *A sequence is an A.P. with common difference 'A' if and only if its n^{th} terms is of the form $a_n = An + B$.*

Ans. (a)

SOLUTION Statement-2 is true (See Example 2 on page 5.6 in main book). Statement-1 is also true and statement-2 is a correct explanation for statement-1. Hence, option (a) is correct.

EXAMPLE 23 *Statement-1 (A): The sum of 20 terms of the A.P. 1, 3, 5, 7, ... is 400.*
Statement-2 (R): The sum of first n odd natural numbers is n^2.

Ans. (a)

SOLUTION 1, 3, 5, 7, 9, ..., $(2n-1)$ are first n odd natural numbers. Let S be their sum. Then,

$$S = 1 + 3 + 5 + 7 + 9 + \ldots + (2n-1)$$

$$\Rightarrow \quad S = \frac{n}{2}(1 + 2n - 1) = n^2 \qquad \left[\text{Using } S_n = \frac{n}{2}(a_1 + a_n)\right]$$

So, statement-2 is true. Using this statement, we find that

$$1 + 3 + 5 + 7 + \ldots \text{ upto 20 terms } = 20^2 = 400.$$

So, statement-1 is also true and statement-2 is a correct explanation for statement-1.
Hence, option (a) is correct.

EXAMPLE 24 *Statement-1 (A): The sum of 20 terms of the series 11, 13, 15, 17, ... is 600.*
Statement-2 (R): The sum of first n odd natural numbers is n^2.

Ans. (b)

SOLUTION Clearly, statement-2 is true (See example 20).
Let S denote the sum of the series 11, 13, 15, 17 ... upto 20 terms. Clearly, it is an A.P. with first term $a = 11$ and common difference $d = 2$.

$$\therefore \quad S = \frac{20}{2}\{2 \times 11 + (20-1) \times 2\} = 10\,(22 + 38) = 600$$

So, statement-1 is also true. But, statement-2 is not a correct explanation for statement-1.
Hence, option (b) is correct.

EXAMPLE 25 *Statement-1 (A): The sum of the n terms of the A.P. 1, 5, 9, 13, ... is $2n^2 + n$.*
Statement-2 (R): Let S_n denote the sum of n terms of an A.P. with first term a and common difference d such that d = 2a. Then for any natural number m, $\frac{S_{mn}}{S_m}$ is independent of m.

Ans. (d)

SOLUTION 1, 5, 9, 13, ... is an A.P. with first term 1 and common difference 4. Let S_n denote the sum of its n terms. Then,

$$S_n = \frac{n}{2}\{2 \times 1 + (n-1) \times 4\} = 2n^2 - n$$

So, statement-1 is not true i.e. it is false.

$$\text{Now,} \quad \frac{S_{mn}}{S_m} = \frac{\frac{mn}{2}\{2a + (mn-1)\,d\}}{\frac{m}{2}\{2a + (m-1)\,d\}} = \frac{n\{(2a-d) + mnd\}}{\{(2a-d) + md\}} = \frac{n\,(mnd)}{md} = n^2, \text{if } d = 2a.$$

Clearly, $\frac{S_{mn}}{S_m}$ is independent of m, if $d = 2a$. So, statement-2 is true. Hence, option (d) is correct.

EXAMPLE 26 *Statement-1 (A): a, b, c are in A.P. iff 2b = a + c.*
Statement-2 (R): In an A.P. the sum of the terms equidistant from the beginning and the end is always same and is equal to the sum of first and least term.

Ans. (b)

SOLUTION a, b, c are in A.P. $\Leftrightarrow b - a = c - b \Leftrightarrow 2b = a + c$. So, statement-1 is true.

Let $a_1, a_2, \ldots, a_n$ be an A.P. with common difference d. Then,

$$k^{th} \text{ term from the beginning } + k^{th} \text{ term from the end}$$
$$= a_k + a_{n-k+1} = \{a_1 + (k-1)d\} + \{a_1 + (n-k+1-1)d\} = a_1 + a_1 + (n-1)d = a_1 + a_n$$

So, statement-2 is correct. Clearly, statement-2 is not a correct explanation for statement-1. Hence, option (b) is correct.

EXAMPLE 27 *Statement-1 (A): If a_n denotes the nth term of the A.P. 2, 7, 12, 17, ..., then* $a_{5050} - a_{2020} = 15150$.

Statement-2 (R): If a_n denotes the nth term of an A.P. with common difference d, then $a_p - a_q = (p-q)d$.

Ans. (a)

SOLUTION Let a be the first term of the A.P. whose common difference is d. Then,

$$a_p = a + (p-1)d \text{ and } a_q = a + (q-1)d.$$

$$\therefore \quad a_p - a_q = \{a + (p-1)d\} - \{a + (q-1)d\} = (p-q)d$$

So, statement-2 is true. Using statement-2 for the A.P. 2, 7, 12, 17, ..., we obtain

$$a_{5050} - a_{2020} = (5050 - 2020) \times 5 = 15150$$

So, statement-1 is also true and statement-2 is a correct explanation for statement-1. Hence, option (a) is correct.

PRACTICE EXERCISES

MULTIPLE CHOICE QUESTIONS (MCQs)

Mark the correct alternative in each of the following:

1. The common difference of the A.P. is $\frac{1}{2q}, \frac{1-2q}{2q}, \frac{1-4q}{2q}, \ldots$ is

(a) -1 (b) 1 (c) q (d) $2q$

[CBSE 2013]

2. The common difference of the A.P. $\frac{1}{3}, \frac{1-3b}{3}, \frac{1-6b}{3}, \ldots$ is

(a) $\frac{1}{3}$ (b) $-\frac{1}{3}$ (c) $-b$ (d) b

[CBSE 2013]

3. The common difference of the A.P. $\frac{1}{2b}, \frac{1-6b}{2b}, \frac{1-12b}{2b}, \ldots$ is

(a) $2b$ (b) $-2b$ (c) 3 (d) -3

[CBSE 2013]

4. If k, $2k-1$ and $2k+1$ are three consecutive terms of an AP, the value of k is

(a) -2 (b) 3 (c) -3 (d) 6

[CBSE 2014]

5. The next term of the A.P. $\sqrt{7}, \sqrt{28}, \sqrt{63}, \ldots$

(a) $\sqrt{70}$ (b) $\sqrt{84}$ (c) $\sqrt{97}$ (d) $\sqrt{112}$

[CBSE 2014]

6. The first three terms of an A.P. respectively are $3y - 1$, $3y + 5$ and $5y + 1$. Then, y equals
(a) -3 (b) 4 (c) 5 (d) 2
[CBSE 2014]

7. If $\frac{1}{x+2}, \frac{1}{x+3}, \frac{1}{x+5}$ are in A.P. Then, $x =$
(a) 5 (b) 3 (c) 1 (d) 2

8. The n^{th} term of an A.P., the sum of whose n terms is S_n, is
(a) $S_n + S_{n-1}$ (b) $S_n - S_{n-1}$ (c) $S_n + S_{n+1}$ (d) $S_n - S_{n+1}$

9. The common difference of an A.P., the sum of whose n terms is S_n, is
(a) $S_n - 2S_{n-1} + S_{n-2}$ (b) $S_n - 2S_{n-1} - S_{n-2}$ (c) $S_n - S_{n-2}$ (d) $S_n - S_{n-1}$

10. The sum of first 20 odd natural numbers is
(a) 100 (b) 210 (c) 400 (d) 420
[CBSE 2012]

11. If 18, a, b, -3 are in A.P., the $a + b =$
(a) 19 (b) 7 (c) 11 (d) 15

12. The first term of an A.P. is p and the common difference is q, then its 10^{th} term is
(a) $q + 9p$ (b) $p - 9q$ (c) $p + 9q$ (d) $2p + 9q$
[CBSE 2020]

13. The value of x for which $2x$, $x + 10$ and $3x + 2$ are the three consecutive terms of an A.P. is
(a) -6 (b) 18 (c) 6 (d) -18
[CBSE 2020]

14. If the sum of three consecutive terms of an increasing A.P. is 51 and the product of the first and third of these terms is 273, then the third term is
(a) 13 (b) 9 (c) 21 (d) 17

15. $\left(3-\frac{1}{n}\right)+\left(3-\frac{2}{n}\right)+\left(3-\frac{3}{n}\right)+\ldots$ upto n terms is
(a) $\frac{1}{2}(3n-1)$ (b) $\frac{1}{2}(3n+1)$ (c) $\frac{1}{2}(5n-1)$ (d) $\frac{1}{2}(5n+1)$

16. The sum of first 16 terms of the A.P.: 10, 6, 2, ..., is
(a) -320 (b) 320 (c) -352 (d) -400
[NCERT EXEMPLAR]

17. If the first term of an A.P. is -5 and the common difference is 2, then the sum of first 6 terms is
(a) 0 (b) 5 (c) 6 (d) 15
[NCERT EXEMPLAR]

18. The 4^{th} term from the end of the AP: $-11, -8, -5, \ldots, 49$ is
(a) 37 (b) 40 (c) 43 (d) 58
[NCERT EXEMPLAR]

19. Which term of the A.P. 21, 42, 63, 84, ... is 210?
(a) 9^{th} (b) 10^{th} (c) 11^{th} (d) 12^{th}
[NCERT EXEMPLAR]

20. If the 2^{nd} term of an A.P. is 13 and 5^{th} term is 25, what is its 7^{th} term?
(a) 30 (b) 33 (c) 37 (d) 38
[NCERT EXEMPLAR]

21. The first and last terms of an A.P. are 1 and 11. If the sum of its terms is 36, then the number of terms will be
(a) 5 (b) 6 (c) 7 (d) 8

22. If four numbers in A.P. are such that their sum is 50 and the greatest number is 4 times the least, then the numbers are
(a) 5, 10, 15, 20 (b) 4, 10, 16, 22 (c) 3, 7, 11, 15 (d) none of these

23. If the first term of an A.P. is 2 and common difference is 4, then the sum of its 40 terms is
(a) 3200 (b) 1600 (c) 200 (d) 2800

24. The number of terms of the A.P. 3, 7, 11, 15, ... to be taken so that the sum is 406 is
(a) 5 (b) 10 (c) 12 (d) 14

25. Sum of n terms of the series $\sqrt{2}+\sqrt{8}+\sqrt{18}+\sqrt{32}+\cdots$ is
(a) $\frac{n(n+1)}{2}$ (b) $2n(n+1)$ (c) $\frac{n(n+1)}{\sqrt{2}}$ (d) 1

26. The 9th term of an A.P. is 449 and 449th term is 9. The term which is equal to zero is
(a) 501^{th} (b) 502^{th} (c) 458^{th} (d) none of these

27. If the first term of an A.P. is a and n^{th} term is b, then its common difference is
(a) $\frac{b-a}{n+1}$ (b) $\frac{b-a}{n-1}$ (c) $\frac{b-a}{n}$ (d) $\frac{b+a}{n-1}$

28. If $\frac{5+9+13+\cdots \text{to } n \text{ terms}}{7+9+11+\cdots \text{to } (n+1) \text{ terms}}=\frac{17}{16}$, then $n=$
(a) 8 (b) 7 (c) 10 (d) 11

29. The sum of n terms of an A.P. is $3n^2+5n$, then 164 is its
(a) 24^{th} term (b) 27^{th} term (c) 26^{th} term (d) 25^{th} term

30. If the n^{th} term of an A.P. is $2n+1$, then the sum of first n terms of the A.P. is
(a) $n(n-2)$ (b) $n(n+2)$ (c) $n(n+1)$ (d) $n(n-1)$

31. The sum of first 24 terms of the sequence whose nth terms is given by $a_n=3+\frac{2}{3}n$
(a) 270 (b) 272 (c) 382 (d) 384

32. The sum of first five multiples of 3 is
(a) 45 (b) 55 (c) 65 (d) 75

[NCERT EXEMPLAR]

33. If the sum of P terms of an A.P. is q and the sum of q terms is p, then the sum of $p+q$ terms will be
(a) 0 (b) $p-q$ (c) $p+q$ (d) $-(p+q)$

34. If the sum of n terms of an A.P. be $3n^2+n$ and its common difference is 6, then its first term is
(a) 2 (b) 3 (c) 1 (d) 4

[CBSE 2023]

35. Two A.P.'s have the same common difference. The first term of one of these is 8 and that of the other is 3. The difference between their 30^{th} terms is
(a) 11 (b) 3 (c) 8 (d) 5

[CBSE Sample Paper 2024]

36. Let S_n denote the sum of n terms of an A.P. whose first term is a. If the common difference d is given by $d=S_n-kS_{n-1}+S_{n-2}$, then $k=$
(a) 1 (b) 2 (c) 3 (d) none of these

37. The first and last term of an A.P. are a and l respectively. If S is the sum of all the terms of the A.P. and the common difference is given by $\frac{l^2-a^2}{k-(l+a)}$, then $k=$

(a) S (b) $2S$ (c) $3S$ (d) none of these

38. If the sum of first n even natural numbers is equal to k times the sum of first n odd natural numbers, then $k=$

(a) $\frac{1}{n}$ (b) $\frac{n-1}{n}$ (c) $\frac{n+1}{2n}$ (d) $\frac{n+1}{n}$

39. If the first, second and last term of an A.P. are a, b and $2a$ respectively, its sum is

(a) $\frac{ab}{2(b-a)}$ (b) $\frac{ab}{b-a}$ (c) $\frac{3ab}{2(b-a)}$ (d) none of these

40. If S_1 is the sum of an arithmetic progression of 'n' odd number of terms and S_2 the sum of the terms of the series in odd places, then $\frac{S_1}{S_2}=$

(a) $\frac{2n}{n+1}$ (b) $\frac{n}{n+1}$ (c) $\frac{n+1}{2n}$ (d) $\frac{n+1}{n}$

41. If in an A.P., $S_n=n^2p$ and $S_m=m^2p$, where S_r denotes the sum of r terms of the A.P., then S_p is equal to

(a) $\frac{1}{2}p^3$ (b) mnp (c) p^3 (d) $(m+n)p^2$

42. If S_n denote the sum of the first n terms of an A.P. If $S_{2n}=3S_n$, then $S_{3n}:S_n$ is equal to

(a) 4 (b) 6 (c) 8 (d) 10

43. In an AP, $S_p=q, S_q=p$ and S_r denotes the sum of first r terms. Then, S_{p+q} is equal to

(a) 0 (b) $-(p+q)$ (c) $p+q$ (d) pq

44. If S_r denotes the sum of the first r terms of an A.P. Then, $S_{3n}:(S_{2n}-S_n)$ is

(a) n (b) $3n$ (c) 3 (d) none of these

45. If the sums of n terms of two arithmetic progressions are in the ratio $\frac{3n+5}{5n+7}$, then their n^{th} terms are in the ratio

(a) $\frac{3n-1}{5n-1}$ (b) $\frac{3n+1}{5n+1}$ (c) $\frac{5n+1}{3n+1}$ (d) $\frac{5n-1}{3n-1}$

46. If S_n denote the sum of n terms of an A.P. with first term a and common difference d such that $\frac{S_x}{S_{kx}}$ is independent of x, then

(a) $d=a$ (b) $d=2a$ (c) $a=2d$ (d) $d=-a$

47. The sum of n terms of two A.P.'s are in the ratio $5n+9:9n+6$. Then, the ratio of their 18^{th} term is

(a) $\frac{184}{321}$ (b) $\frac{178}{321}$ (c) $\frac{175}{321}$ (d) $\frac{176}{321}$

48. The next term of the A.P. $\sqrt{6}, \sqrt{24}, \sqrt{54}, ...$ is

(a) $\sqrt{60}$ (b) $\sqrt{96}$ (c) $\sqrt{72}$ (d) $\sqrt{216}$

[CBSE 2023]

CASE STUDY BASED MCQs

49. Lumber is a significant natural resource that contributes jobs to the US economy. Lumber companies source their raw materials from privately-managed or government-leased forests. In order to process tree wood into usable lumber, this raw material is transported to lumber

mills, where it is cut to different sizes. Lumber is primarily used by the construction industry, though it can also be used to produce furniture, paper and pulp, and composites such as plywood. A lumber company stacks 200 logs in the following manner:

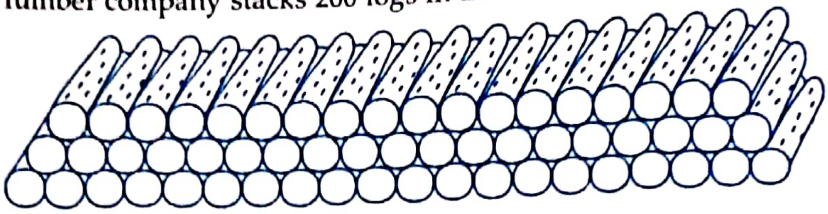


Fig. 5.5

20 logs in the bottom row, 19 in the next row, 18 in the row next to it and so on as shown in Fig. 5.5. Based on the above information answer the following questions:

(i) Number of logs in first row, second row, third row, ...

(a) follow a pattern forming an A.P. with common difference 1.

(b) follow a pattern forming on A.P. with common difference – 1.

(c) do not follow any specific pattern.

(d) follow a pattern forming an A.P. with common difference 2.

(ii) The number of rows in which 200 logs are stacked is

(a) 25 (b) 20 (c) 16 (d) 10

(iii) The number of logs in the top row is

(a) 5 (b) 7 (c) 10 (d) 2

(iv) The number of logs in the middle rows are:

(a) 11, 10 (b) 12, 11 (c) 14, 13 (d) 13, 12

(v) The number of logs in the top two rows is

(a) 10 (b) 11 (c) 9 (d) 12

50. A small terrace at a football ground comprises of 15 steps each of which is 50 m long and built of solid concrete. Each step rises of $\frac{1}{4}$ m and a tread of $\frac{1}{2}$ m (see Fig. 5.6). Let V_1, V_2 $V_3, \ldots, V_{15}$ denote respectively the volumes of concrete required to build the first, second, third, ..., fifteenth step. Based on the above information answer the following questions:

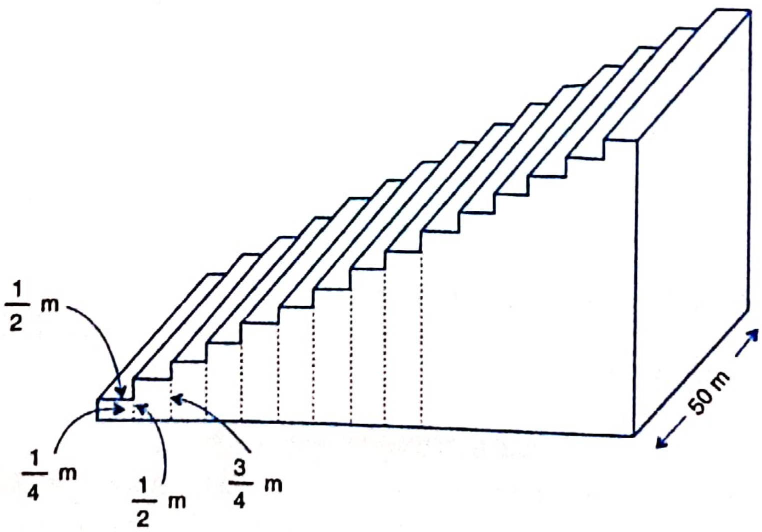


Fig. 5.6

(i) Heights of first, second, third, ..., 15^{th} steps form an A.P. with common difference

(a) $\frac{1}{4}$ m (b) $\frac{1}{2}$ m (c) $\frac{3}{4}$ m (d) $-\frac{1}{4}$ m.

(ii) The value of V_2 is

(a) $25\ m^3$ (b) $50\ m^3$ (c) $12.5\ m^3$ (d) $6.25\ m^3$

(iii) The volume of concrete used in the middle step is

(a) $25\ m^3$ (b) $50\ m^3$ (c) $75\ m^3$ (d) $6.25\ m^3$

(iv) The sum of the surface areas of 15 treads is

(a) $350\ m^2$ (b) $400\ m^2$ (c) $375\ m^2$ (d) $475\ m^2$

(v) The total volume of the concrete required to build the terrace is

(a) $800\ m^3$ (b) $375\ m^3$ (c) $650\ m^3$ (d) $750\ m^3$

51. A Carpenter wants to manufacture a 3 metre ladder having rungs 25 cm apart (see Fig. 5.7). The rungs decrease uniformly in length from 45 cm at the bottom to 25 cm at the top and the top and bottom rungs are 2.5 metre apart.

Based on the above information answer the following questions:

(i) Total number of rungs in the ladder is

(a) 10 (b) 9 (c) 11 (d) 12

(ii) The lengths of rungs from bottom to top form an A.P. with first and last terms as 45 cm and 25 cm respectively. The common difference of the A.P. formed is

(a) −2 cm (b) − 2.5 cm (c) 4.5 cm (d) 2 cm

(iii) The length of the middle rung is

(a) 33 cm (b) 35 cm (c) 37 cm (d) 35.5 cm.

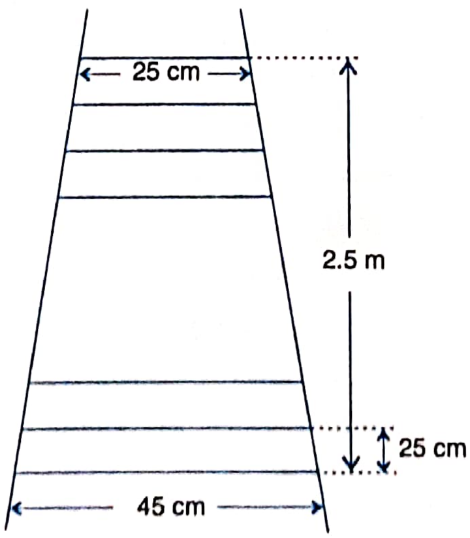


Fig. 5.7

(iv) Length of the wood used for rungs is

(a) 3.75 metres (b) 2.85 metres (c) 3.85 metres (d) 4 metres

(v) Length of the wood required for the ladder

(a) 68.5 metres (b) 9.85 metres (c) 5.85 metres (d) 8.85 metres

(vi) If the wood costs ₹ 100 per metres, the cost of ladder is

(a) ₹ 685 (b) ₹ 585 (c) ₹ 885 (d) ₹ 985

52. In a potato race, a bucket is placed at the starting point, which is 5 m from the first potato, and the other potatoes are placed 3 m apart in a straight line. There are n potatoes in the line (See Fig. 5.8). Each competitor starts from the bucket, picks up the nearest potato, runs back with it, drops it in the bucket, runs back to pick up the next potato, runs to the bucket to drop it in the bucket, and she continues in the same way until all the potatoes are in the bucket. Based on the above information answer the following questions:

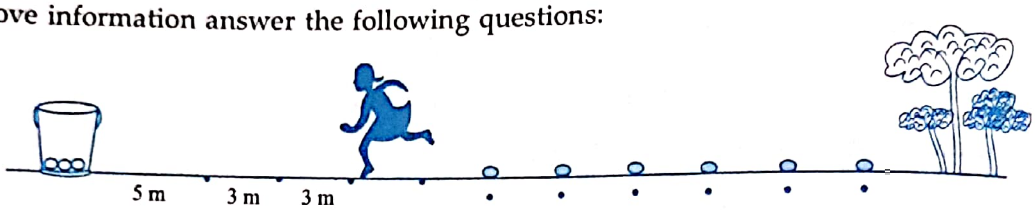


Fig. 5.8

(i) Distance run by the competitor to pickup and drop first potato in the bucket, is
(a) 5 cm (b) 8 m (c) 10 m (d) 7 m

(ii) Distance run by the competitor to pick up and drop n^{th} potato in the bucket, is
(a) $(3n+2)$ m (b) $2(3n+2)$ m (c) $2(3n-1)$ m (d) $6(n-1)$ m

(iii) Total distance run by the competitor to pick up and drop first four potatoes is
(a) 36 metres (b) 40 metres (c) 86 metres (d) 76 metes

(iv) Total distance run by the competitor to pick up and drop n potatoes in the basket is
(a) $n(3n+2)$ m (b) $2n(3n+2)$ m (c) $n(3n+7)$ m (d) $3n^2+7$ m

(v) If $d_1, d_2, d_3, \ldots, d_n$ denote distances run by the competitor to pick up first, second, third, ..., n^{th} potato respectively, then. $d_1, d_2, d_3, \ldots, d_n$ form an A.P. with common difference
(a) 3 (b) 6 (c) 7 (d) 5

53. In a lemon race, a bucket is placed at a starting point, which is 6 m away from the first lemon and other lemons are placed 4 m apart from each other in a straight line. There are 10 lemons in a line. Riya starts from the bucket, picks up the nearest lemon, runs back with it, drops it in the bucket, runs back to pick up the next lemon, runs to the bucket to drop it in and continues until all the lemons are in the bucket. Based on the above information answer the following questions:

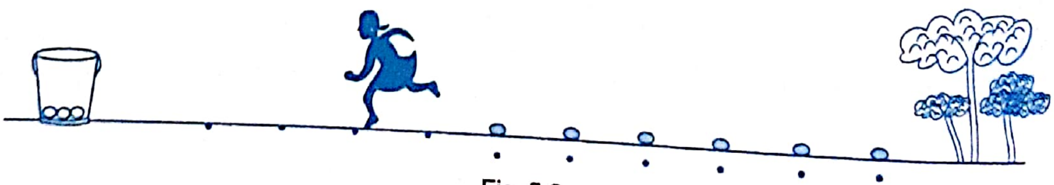


Fig. 5.9

(i) The lemons are placed in a straight line depicts which part of sequence?
(a) Geometric (b) Arithmetic (c) Linear (d) Harmonic

(ii) The total distance covered by Riya is
(a) 370 m (b) 480 m (c) 460 m (d) 400 m

(iii) The formula to find n^{th} term of the Arithmetic sequence (progression) is
(a) $a_n = a-(n-1)d$
(b) $a_n = a(n-1)d$
(c) $a_n = a+(n-1)d$
(d) $S_n = \frac{n}{2}(2a+(n-1)d)$

(iv) The difference between the terms of arithmetic sequence is called as
(a) common ratio
(b) common difference
(c) common term
(d) none of these

54. Figure 5.10, shows playing cards stacked together in a following manner:
56 cards are stacked in this manner. 14 cards are in the bottom row, 12 in the next row, 10 in the row next to it and so on. Based on this information answer the following questions:

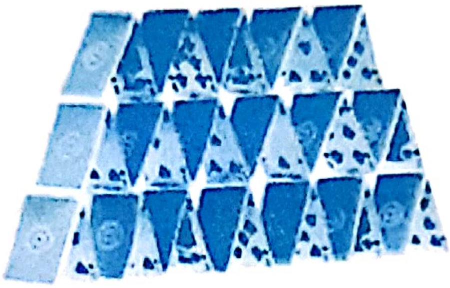


Fig. 5.10

(i) The total number of rows in which the cards are stacked is

(a) 7 (b) 6 (c) 8 (d) 9

(ii) The number of cards in the top row is

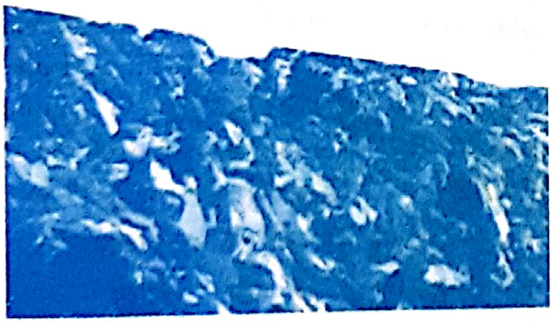
(a) 4 (b) 6 (c) 1 (d) 2

(iii) The mathematical concept applied in solving the above problem is

(a) Linear equations (b) Probability

(c) Arithmetic progression (d) Coordinate geometry

55. Do you know old clothes which are thrown as waste not only fill the landfill site but also produce very harmful greenhouse gas. So, it is very important that we reuse old clothes in whatever way we can. The picture given below on the right, shows a footmat (rug) made out of old *t*-shirts yarn. Observing the picture, you will notice that a number of stitches in circular rows are making a pattern : 6, 12, 18, 24,...



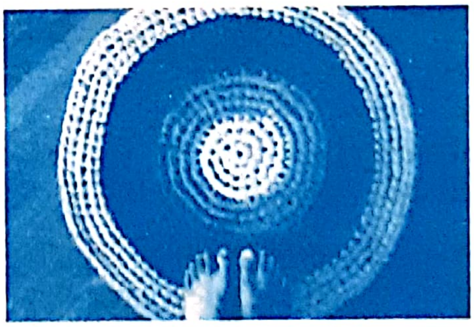


Fig. 5.11

Based on the above information, answer the following questions:

(i) Check whether the given pattern forms an AP. If yes, find the common difference and the next term of the AP.

(ii) Write the n^{th} term of the AP. Hence, find the number of stitches in the 10^{th} circular row.

[CBSE 2022]

ASSERTION-REASON BASED MCQs

Each of the following questions contains STATEMENT-1 (Assertion) and STATEMENT-2 (Reason) and has following four choices (a), (b), (c) and (d), only one of which is the correct answer. Mark the correct choice.

(a) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1.

(b) Statement-1 is true, Statement-2 is true; Statement-2 is not a correct explanation for Statement-1.

(c) Statement-1 is true, Statement-2 is false.

(d) Statement-1 is false, Statement-2 is true.

56. Statement-1 (A): The n^{th} term a_n of an A.P., the sum of whose n terms is S_n, is given by $a_n = S_n - S_{n-1}, n > 1$.

Statement-2 (R): The common difference 'd' of an A.P., the sum of whose n terms S_n is given by $d = S_n - 2S_{n-1} + S_{n-2}, n > 2$.

57. Statement-1 (A): The sum of n terms of the series $\sqrt{5}+\sqrt{20}+\sqrt{45}+\sqrt{80}+\ldots$ is $\frac{\sqrt{5}}{2}n(n+1)$.

Statement-2 (R): The sum of first n natural numbers is $\frac{n(n+1)}{2}$.

58. Statement-1 (A): The sum of n terms of an AP with first and last terms as a_1 and a_n respectively, is $S_n = \frac{n}{2}(a_1 + a_n)$.

Statement-2 (R): The sum of the terms equidistant from the beginning and end in the A.P. $a_1, a_2, a_3, \ldots, a_{n-2}, a_{n-1}, a_n$ is equal to $a_1 + a_n$.

59. Statement-1 (A): The sum of first n even natural numbers is $n(n+1)$.

Statement-2 (R): The sum of first n odd natural numbers is $n(n-1)$.

60. Statement-1 (A): If $a_1, a_2, a_3, \ldots, a_n$ is an AP such that $a_1 + a_4 + a_7 + \ldots + a_{16} = 147$, then $a_1 + a_6 + a_{11} + a_{16} = 98$.

Statement-2 (R): In an A.P. , the sum of the terms equidistant from the beginning andthe end is always same and is equal to the sum of first and last term.

61. Statement-1 (A): a, b, c are in A.P. if and only if $2b = a + c$.

Statement-2 (R): The sum of first n odd natural numbers is n^2. [CBSE 2023]

62. Statement-1 (A): $-5, -\frac{5}{2}, 0, \frac{5}{2}, \ldots$ is an A.P.

Statement-2 (R): The terms of an A.P. cannot have both positive and negative rational numbers.

[CBSE Sample Paper 2024]

ANSWERS

1. (a)	2. (c)	3. (d)	4. (b)	5. (d)	6. (c)	7. (c)	8. (b)	9. (a)
10. (c)	11. (d)	12. (c)	13. (c)	14. (c)	15. (c)	16. (a)	17. (a)	18. (b)
19. (b)	20. (b)	21. (b)	22. (a)	23. (a)	24. (d)	25. (c)	26. (c)	27. (b)
28. (b)	29. (b)	30. (b)	31. (b)	32. (a)	33. (d)	34. (d)	35. (d)	36. (b)
37. (b)	38. (d)	39. (c)	40. (a)	41. (c)	42. (b)	43. (b)	44. (c)	45. (b)
46. (b)	47. (a)	48. (b)						

49. (i) (b) (ii) (c) (iii) (a) (iv) (d) (v) (b)

50. (i) (a) (ii) (c) (iii) (b) (iv) (c) (v) (d)

51. (i) (c) (ii) (a) (iii) (b) (iv) (c) (v) (b) (vi) (d)

52. (i) (c) (ii) (b) (iii) (d) (iv) (c) (v) (b)

53. (i) (b) (ii) (b) (iii) (c) (iv) (b)

54. (i) (a) (ii) (d) (iii) (c)

55. (i) 6, 30 (ii) $6n$, 60

56. (b)	57. (a)	58. (a)	59. (c)	60. (a)	61. (b)	62. (c)